CLAIMS

1. An automated reactor-based system for treating water, comprising:

a reactor including an inlet to provide water at an inlet flow rate into said reactor;

structure for adding at least one treatment chemical to said water;

structure for dynamically adjusting an output flow rate of said water from said reactor, and

a controller communicably connected to said structure for adjusting output flow rate to dynamically control residence time of said water in said reactor to a predetermined residence time, said controller receiving at least one input including said inlet flow rate and generating an output flow rate value to achieve said predetermined residence time, said output flow rate value communicated to and implemented by said structure for dynamically adjusting an output flow rate.

2. The system of claim 1, wherein said structure for dynamically adjusting an output flow rate comprises a flow obstacle.

3. The system of claim 2, wherein said flow obstacle is a weir.

4. The system of claim 3, wherein said weir provides a dynamically adjustable height.

5. The system of claim 3, wherein said weir provides a dynamically adjustable gap.

6. The system of claim 5, wherein said dynamically adjustable gap comprises an obstruction including a vertical gap.

7. The system of claim 1, wherein said structure for dynamically adjusting an output flow rate comprises a pump.

8. The system of claim 1, wherein said controller is a feed forward controller.

9. The system of claim 1, wherein said controller is a proportional-integral-derivative (PID) controller.

10. The system of claim 1, wherein said controller is a digital controller.

11. The system of claim 1, wherein said controller is an analog controller.

12. The system of claim 1, wherein said controller is selected from the group consisting of a lead-lag controller, a predictive controller and a adaptive controller.

13. The system of claim 1, wherein a substantially constant residence time of said water in said reactor is provided by said system.

14. The system of claim 1, wherein said system is a wastewater treatment system.

15. An automated method for treating water in an open-flow channel, comprising the steps of:

determining an inlet flow rate of water into an open-flow channel;

adding at least one treatment chemical to said water, and

automatically and dynamically adjusting an output flow rate from said open-fluid channel based on at least one parameter including said inlet flow rate to achieve a predetermined residence time of said water in said open-flow channel.

16. The method of claim 15, wherein a substantially constant residence time of said water in said flow-channel is provided.

17. The method of claim 15, wherein said open-flow channel is included in a wastewater treatment system.

18. The method of claim 15, wherein said treatment chemical comprises chlorine.

19. The method of claim 15, wherein said automatically and dynamically adjusting an output flow rate step comprises dynamically adjusting a height of a flow obstacle or a gap of a flow obstacle.

20. The method of claim 15, wherein said automatically and dynamically adjusting an output flow rate step comprises dynamically adjusting a height of a weir.

21. The method of claim 15, wherein said automatically and dynamically adjusting an output flow rate step comprises dynamically adjusting a pumping rate of a pump.